

UNIT  
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## FOOD RISKS

## A. WHAT IS FOOD SAFETY? \_\_\_\_\_

## 1 How much do you know about food poisoning?

Do you know the temperature inside your refrigerator? It should be 4°C or colder. The surest way to find out is to buy a thermometer and keep it in the fridge. Now answer these questions.

- Which of the following is the most important in the war against food poisoning?
  - Strong disinfectants
  - A refrigerator
  - A microwave oven
  - A conventional oven
- If there is a power cut for 3 hours, what would you do about the contents of your freezer?
  - Throw everything away
  - Distribute the food among your neighbours and tell them to eat it straight away
  - Just leave the whole thing alone and let it refreeze
  - Feel the food to see if it is completely or partially thawed and then decide what to do.
- You have a chilled recipe dish containing chicken. It is 2 days past the 'best before' date. You think it has been kept in the fridge, so what do you do?
  - Throw it away
  - Cook it in the usual way and eat it
  - Cook it for a few minutes longer than stated and eat it
- Which of these is the most important? Washing your hands...
  - before handling raw meat/poultry
  - after handling raw meat/poultry
  - after handling cooked meat poultry
  - a. b. and c. are equally important
- Some foods such as meats, fish and bacon are now packed in gas-flushed packs to extend their storage life. How should you keep them?
  - In the fridge for up to 3 days
  - In the larder for up to 3 days
  - In the fridge for up to 5 days
  - In the fridge for the time stated on the pack

## How did you score?

1.  $a = 1$   $b = 5$   $c = 3$   $d = 3$

Cooking should kill bacteria. It probably won't destroy toxins. Disinfectants are used on surfaces, not food.

2.  $a = 1$   $b = 2$   $c = 3$   $d = 5$

A three hour power cut won't have any significant effect on a well-stocked freezer.

3.  $a = 3$   $b = 0$   $c = 1$

It is recommended that food is used by the 'best before' date.

4.  $a = 3$   $b = 4$   $c = 1$   $d = 1$

5.  $a = 2$   $b = 0$   $c = 1$   $d = 4$

Gas flushed packs are not sterile. They must be kept cool and used within the time stated. Never pierce them.

21 Everyone can be confident about eating your food.

11-20 Room for some improvement.

5-10 You may have been lucky so far.

Don't leave it to chance from now on!

## B. FOODBORNE ILLNESS

### MICROBIAL FOOD POISONING

Food poisoning and food infections are fairly common occurrences that most of us will experience at some time. Food poisoning usually manifests itself as an attack of gastroenteritis the symptoms of which are nausea, vomiting, pyrexia, diarrhoea and abdominal pain.

Foods cause food poisoning when:

- they are contaminated with poisonous chemicals
- they are poisonous themselves
- they contain food poisoning microorganisms and/or their toxins.

Salmonellosis is a form of food infection that may result when foods containing *Salmonella* bacteria are consumed. The bacteria are spread through contact with the intestinal contents or excrement of animals, including humans. *Salmonella* bacteria thrive at temperatures between 4.4°C and 60°C. They do not grow at refrigerator or freezer temperatures but survive refrigeration and freezing and will begin to grow again once warmed to room temperatures.

Campylobacteriosis is caused by ingesting food or water contaminated with the bacteria *Campylobacter jejuni*. The organism grows best in a reduced oxygen environment, is easily killed by heat (48°C), it is inhibited by acid, salt and drying and will not multiply at temperatures below 30°C. Preventive measures include pasteurizing milk, cooking raw meat, poultry and fish, and preventing cross-contamination between raw and cooked or ready-to-eat foods.

As a result of its wide distribution in the environment, its ability to survive for long periods of time under adverse conditions, and its ability to grow at refrigeration temperatures, *Listeria monocytogenes* is recognized as an important foodborne pathogen. The organism grows in the pH range of 5.0-9.5. It is salt tolerant and relatively resistant to drying, but easily destroyed by heat. Preventive measures include maintaining good sanitation, pasteurizing milk and cooking foods thoroughly. *Staphylococci* bacteria are found on the skin and in the nose and throat of most people, they are also

widespread in untreated water, raw milk and sewage. When staphylococci get into warm food and multiply, they produce a toxin - not detectable by taste or smell - that causes illness. The bacteria can be killed by temperatures of 48°C but its toxin is heat resistant. To prevent contamination, food must be kept clean, either hot (above 60°C) or cold (below 4.4°C).

Botulism is the deadliest kind of food poisoning. The greatest danger of botulism is in *underprocessed* home-canned foods. *Clostridium botulinum*, spore-forming bacteria, grow without oxygen in places such as canned foods, producing a poison that can cause death. It attacks the nervous system, progressively causing double vision, impaired speech, muscle paralysis and difficulty in breathing. Home-canned vegetables and meats should be boiled 10 minutes plus 1 minute per 1,000 feet elevation before tasting as a preventive measure to destroy any toxin that may have developed if the spores were not adequately destroyed during processing. The disease produced by *Clostridium Perfringens* is not as severe as botulism. Spores of some strains are so heat resistant that they survive boiling for hours. A warm, moist, protein rich environment with little or no oxygen is necessary for multiplication and growth of the vegetative cells. Holding foods at warm (43°C) rather than hot (60°C) temperatures and cooling foods too slowly are the primary causes of *perfringens* contamination.

Many strains of *E. coli* live peacefully in the gut, however, one strain, *E. coli* 0157:H7, causes a severe form of gastroenteritis. The source of the problem appears to be raw and undercooked foods of animal origin.

*Bacillus cereus* causes food poisoning through the production of toxins in the food in which it grows. The vegetative cells can grow aerobically in most food products of pH 6-7, in the temperature range 10- 48°C), and during growth they produce toxins which are excreted into the food. Cooking usually destroys the vegetative cells.

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Say whether these statements are true or false and correct them when necessary.

- a. Food poisoning may be caused by poisonous foods, by chemicals, by microorganisms and their toxins. ....
- b. *Salmonella* bacteria are killed by refrigeration and freezing. ....
- c. Heat, acid, salt and drying prevent the growth of *C. jejuni*. ....
- d. *Listeria* can grow at fridge, room and body temperatures. ....
- e. *Staphylococci* are more resistant to heat than their toxins. ....
- f. Botulism is one of the most serious forms of food poisoning. ....
- g. *Clostridium botulinum* is an aerobic bacterium. ....
- h. Botulism symptoms resemble those of all the other forms of food poisoning. ....  
.....
- i. Botulism may cause death by respiratory paralysis. ....
- j. *Clostridium perfringens* is easily destroyed by cooking. ....
- k. Both *C. botulinum* and *C. perfringens* cause very severe forms of food poisoning. ....  
.....
- l. *E. coli* live in the intestine of healthy people. ....
- m. *B. cereus* commonly grows in canned foods. ....

## C. FOODBORNE PATHOGENS

### INFECTIOUS ORGANISMS

There are many diseases spread by food which differ from microbial food poisoning in that the food, or water, acts merely as a means of transport for the organisms and not as a medium for growth. Small numbers of the organisms may be sufficient to cause infection, and examples can be found among the protozoa (toxoplasmosis), the bacteria (typhoid fever, paratyphoid fever, dysentery, tuberculosis, brucellosis), the viruses (Q fever, poliomyelitis, infectious hepatitis), and the parasitic worms (trichinosis).

Certain organisms of the genus *Salmonella* in addition to causing food poisoning also cause enteric fevers such as typhoid and paratyphoid fevers. These are true infections in the sense that the organisms invade the body tissues and become systemic. These infections usually arise from the pollution of water, milk or other foods by sewage containing enteric organisms from human excretors.

It has long been suspected that food can act as a vehicle of virus infection for diseases such as poliomyelitis and infectious hepatitis. Other virus particles might accumulate in the same way and be responsible for some incidents of food poisoning.

Trichinosis is a food borne illness which can be fatal, and is caused by a parasitic worm *Trichinella spiralis*. It is transmitted to humans through eating infected, undercooked meat in which the cysts survive.

Toxoplasmosis is another food borne illness which is caused by ingestion of a protozoan parasitic organism *Toxoplasma gondii* in undercooked infected meat. It can also be transmitted through eating contaminated soil on, for example, unwashed vegetables.

There are other parasitic worms and protozoan infections which way also be transmitted by foods.

The best method of preventing any food borne disease – bacterial, viral, parasitic worm or protozoan – is by controlling the source of infection, and preventing the contamination of soil, food and water. The following precautions, however, help to prevent food borne disease:

- Pasteurization of milk, egg, cream.
- Sedimentation, filtration and chlorination of water.
- Efficient sewage removal, and its effective treatment.
- Education of the operatives in food hygiene.
- Protection of raw foods – such as vegetables – from fecal contamination.

(from: Parry-Pawsey, *Principles of Microbiology for students of food technology*, Hutchinson Educ.)

### 3 Answer these questions about Infectious organisms.

- a. How does food poisoning differ from food borne infections? • b. What are some examples of food borne infections? • c. What disease besides salmonellosis may *Salmonella* cause? • d. What are typhoid and paratyphoid fevers due to? • e. What diseases may be caused by food borne virus infection? • f. What is trichinosis? • g. How can it be transmitted? • h. What is toxoplasmosis? • i. How can it be transmitted? • j. How can food borne diseases be prevented? • k. How should milk, dairy products and eggs be treated to prevent food borne disease? • l. How should drinkable water be treated?

# D. HACCP: PROTECTION FROM FOODBORNE DISEASES

## 4 HACCP Questions and Answers.

Choose the correct answer for each of the following questions concerning HACCP:

### HACCP Questions

- a. What is HACCP?
- b. Why is HACCP important?
- c. What are the major food hazards?
- d. What role does microbiological testing play in HACCP programs?
- e. Are there established HACCP guidelines and plans for the food industry to use?
- f. How would HACCP be applied from farm to table?
- g. How can consumers use HACCP?

### HACCP Answers

1. Because it prioritizes and controls potential hazards in food production. By controlling major food risks, such as microbiological, chemical and physical contaminants, the industry can better assure consumers that its products are safe. By reducing foodborne hazards, public health protection is strengthened.
2. It can play a valuable role in HACCP programs as a means for verifying if the HACCP system is working properly. Using microbiological data, plants can identify when the production process is not being properly controlled or verify that prevention efforts are successfully reducing bacterial levels.
3. It is a process control system that identifies where hazards might occur in the food production process and puts into place stringent actions to take to prevent the hazards from occurring.
4. On the farm, there are actions that can be taken to prevent contamination, such as monitoring feed, maintaining farm sanitation, and practicing good animal health management practices. In the plant, contamination must be prevented during slaughter and processing. Once meat and poultry products leave the plant, there should be controls in place during transportation, storage and distribution. In retail stores, proper sanitation, refrigeration, storage and handling practices will prevent contamination. Finally, in restaurants, food service and homes, food handlers must store, handle and cook foods properly to ensure food safety.
5. There are seven HACCP principles that must be followed to implement HACCP. Every food production process in a plant will need an individual HACCP plan that directly impacts the specifics of the product and process.
6. They are microbiological contaminants, such as *Salmonella*, *E. coli* O157:H7, *Listeria*, *Campylobacter*, and *Clostridium botulinum*.
7. They can implement HACCP-like practices in the home by following proper storage, handling, cooking and cleaning procedures. There are many steps to take to ensure food safety. Examples include properly refrigerating meat and poultry, keeping raw meat and poultry separate from cooked and ready-to-eat foods, thoroughly cooking meat and poultry, and refrigerating and cooking leftovers to prevent bacterial growth.